

Physics 22 Problem Set 9

Harry Nelson

Due Monday, June 4 in class

This problem set continues with relativity; read Chapter 12, pp. 466-484, sections 12.3-12.6.

The instructor is Harry Nelson, the TA is Joel Varley. A web page for the course is set up at <http://hep.ucsb.edu/courses/ph22>.

We meet MWF 1:00-1:50pm in 1640 Broida. There are **two sections**, attendance at **both** is mandatory. Joel Varley's section will take place Friday 11:00-11:50pm in 1802 Psychology, and Harry Nelson's will take place Friday 2:00-2:50pm in 2129 Girvetz. Harry Nelson's office hours will follow section until 5:00pm on Friday, either in 2129 Girvetz (if possible) or in the PSC. Joel Varley's office hours will take place in the Physics Study Room (1019 Broida) on Tuesday from 9:00am to 10:00am, Thursday from 9:00am to 10:00am, and Friday noon-1:00pm.

Please make your work neat, clear, and easy to follow. It is hard to grade sloppy work accurately. Generally, make a clear diagram, and label quantities. Derive symbolic answers, and then plug in numbers after a symbolic answer is available.

1. Classify the following event pairs as spacelike, on the light cone, or timelike. For those that are spacelike or timelike, find the velocity of the reference frame in which the events look simultaneous or coincident in space, respectively. In that reference frame, find the non-zero distance or time difference between the two events. You can take the speed of light as $c = 30 \text{ cm/ns}$.
 - (a) $x_A = 0 \text{ cm}$, $t_A = 0 \text{ ns}$; $x_B = 30 \text{ cm}$ $t_B = 0.75 \text{ ns}$
 - (b) $x_A = 0 \text{ cm}$, $t_A = 0 \text{ ns}$; $x_B = -30 \text{ cm}$ $t_B = 1.0 \text{ ns}$
 - (c) $x_A = 0 \text{ cm}$, $t_A = 0 \text{ ns}$; $x_B = -60 \text{ cm}$ $t_B = 1.5 \text{ ns}$
 - (d) $x_A = 10 \text{ cm}$, $y_A = 10 \text{ cm}$, $t_A = 5 \text{ ns}$; $x_B = 40 \text{ cm}$, $y_B = 50 \text{ cm}$, $t_B = 4 \text{ ns}$
 2. K&K 12.5
 3. K&K 12.6
 4. K&K 12.10
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